INERTIAL CONFINEMENT FUSION
Lawrence Livermore National Laboratory

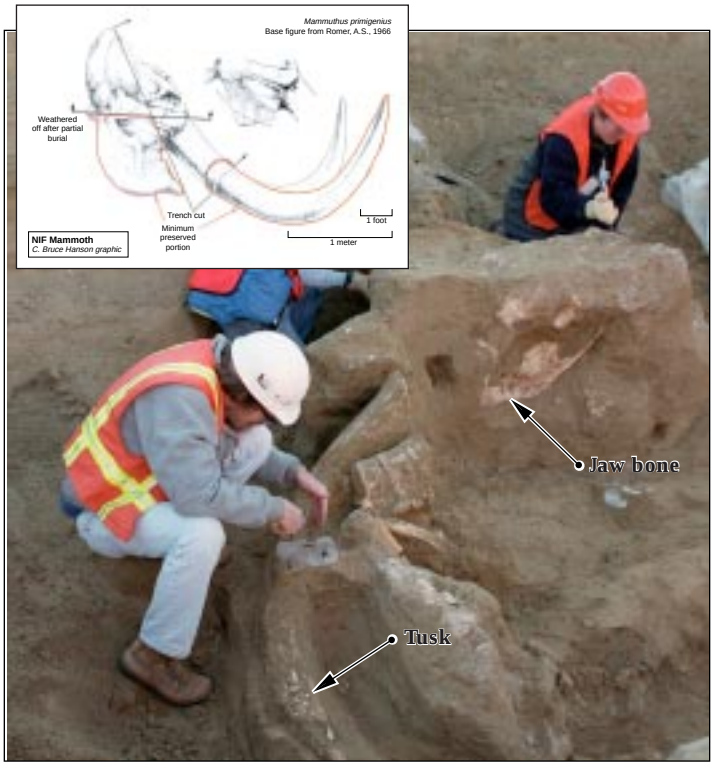
Monthly Highlights

January 1998

UCRL-TB-128550-98-4

NIF Mammoth Find Removed for Preservation.

More mammoth bones were found at the NIF construction site on January 12, 1998. Bones were first discovered on December 15, 1997, and the UC Museum of Paleontology curator visited the site the next day. Excavation began four days later, after approval by the Department of Interior. The find (see photo below), which includes a jaw bone (see inset), partial skull, tusks, some vertebrae, and ribs, all estimated at 10,000 years old, will go to the UC Museum, although the bones might eventually be borrowed for display in the NIF lobby.



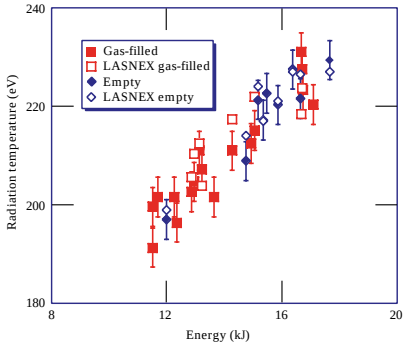
Workers carefully uncover 10,000-year-old mammoth bones. Inset: The outline shows exactly which parts of the skull were found.

Largest ($65.5 Million) NIF Subcontract Awarded.

The new contract, awarded to Hensel Phelps, covers build-out and finishing of the main laser building, not including the portion of the structure housing the laser fusion target chamber. Work will include mat and foundation slabs in two laser bays; installation of all interior walls and doors; heating, ventilating, and air-conditioning systems; plumbing and piping for water and other utilities; fire protection; power and communication ductbanks; complete electrical systems; central plant boilers and chillers; and site finishing work.

Nova Radiation Temperature Measurements.

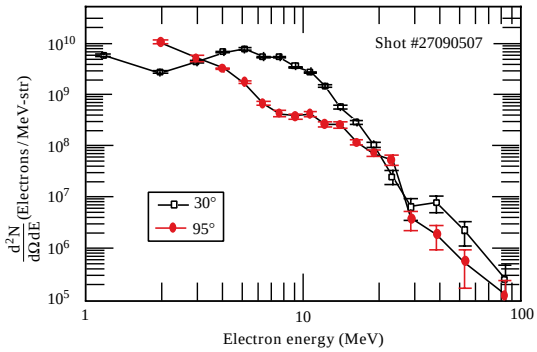
Beam-smoothing experiments performed with "NIF-like" shaped 2-ns laser pulses resulted in low laser scattering losses due to laser–plasma instabilities and improved coupling of the laser energy into the hohlraum. Under best smoothing (see figure below), we have found that more than 93–95% of the laser light was absorbed during the 1-ns high-power part of the laser pulse. We clearly observe higher radiation temperatures, exceeding 230 eV, with increasing absorbed laser energy. The radiation temperatures of both the gas-filled and the empty hohlraums are similar and compare well with detailed LASNEX computer calculations.



Temperature vs. absorbed energy between 0.8 and 1.8 ns of 2-ns pulse.

Petawatt Laser–Matter Experiments Begin.

We have begun a series of laser– matter experiments using the Nova Petawatt laser. The extreme brightness and short duration (~0.5 ps) of such laser sources offer a new tool for both basic science and time-resolved radiography of dense objects. We have obtained electron spectra extending to 100 MeV at ~10^{20} W/cm^2 laser intensity on a 1-mm-thick gold target (see figure below). These high-current-density, energetic electrons will yield copious bremsstrahlung radiation as the electrons slow down in high-atomic-number targets. As such, these hard x-ray sources may offer an alternative to conventional sources presently used for stockpile stewardship radiography.



Electron spectra acquired at 30° and 95° with respect to the laser axis.

For comments about content of the *Monthly Highlights*, contact Don Correll (510) 422-6784.
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